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ASSOCIATION

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JULY 1960 · NUMBER 127

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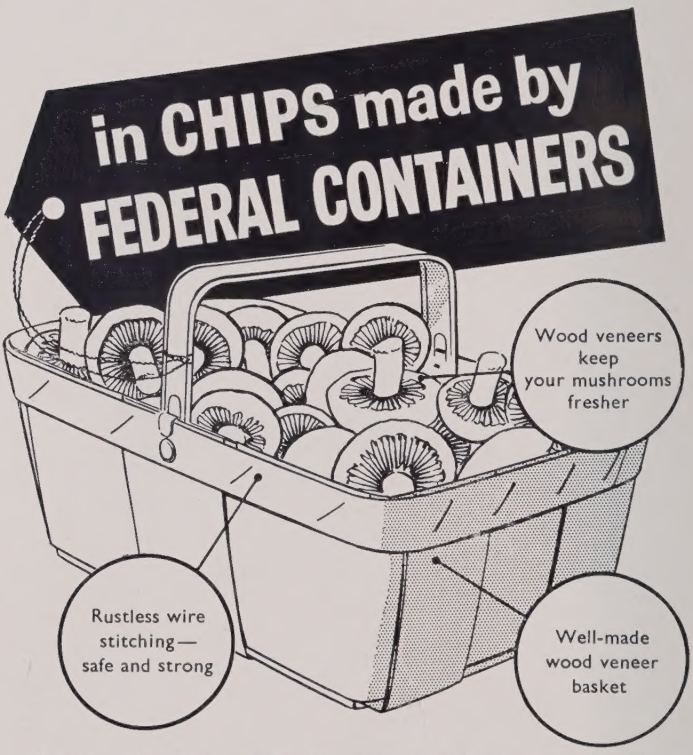

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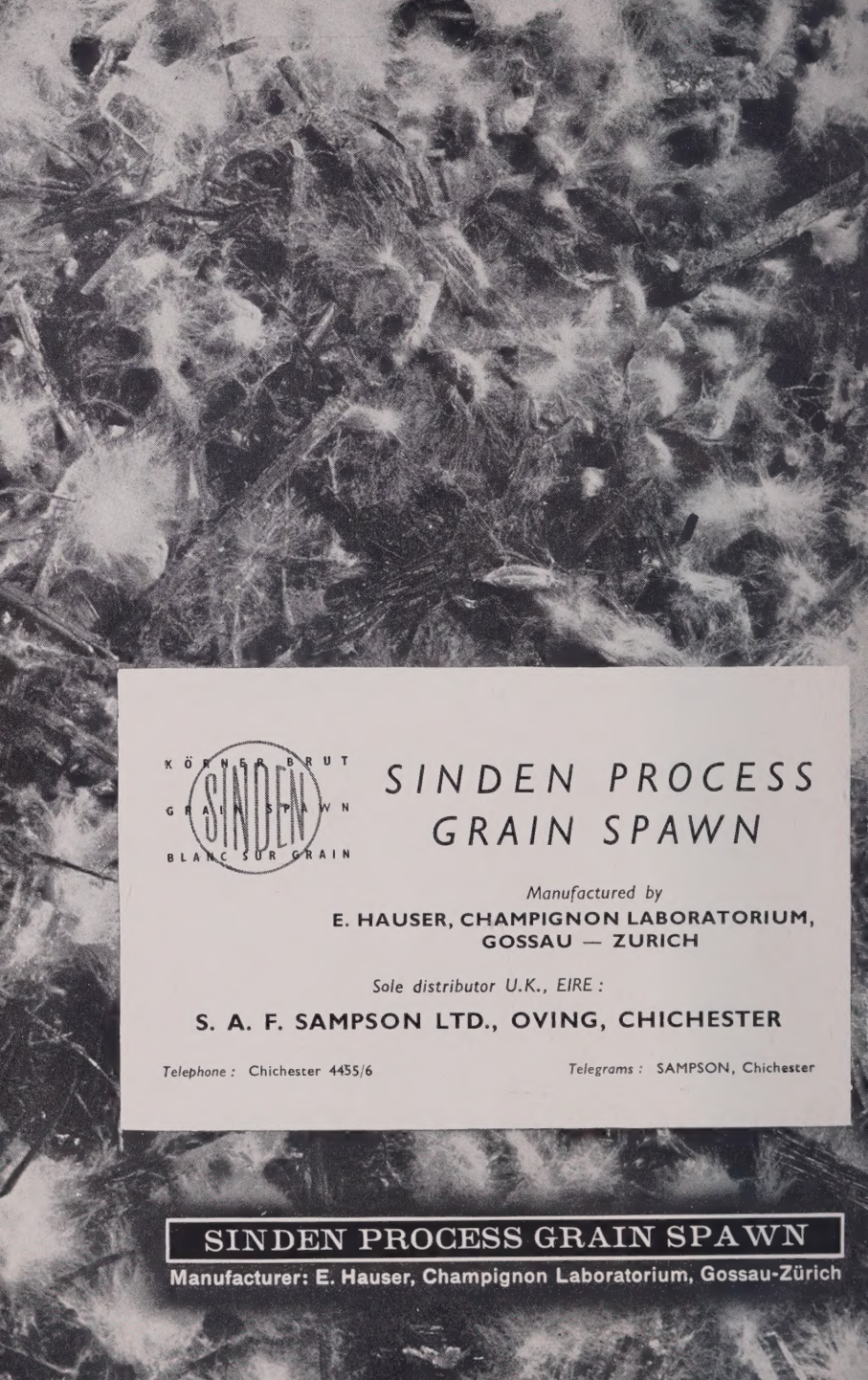

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The
MGA BULLETIN

JULY - 1960
NUMBER 127

EDITORIAL

SOONER OR LATER

The opinion which is held by many people, and not infrequently expressed, is that space may be had in newspapers and magazines simply for the asking. In other words, provided suitable material is supplied to Editors of this and that publication, space is there, amongst the written matter, just waiting for the taking.

Nothing is further from the truth. With the possible exception of the *Bulletin* Editor, the occupant of the editorial chair is not sitting at his desk, with tongue hanging out, just waiting for material. More often than not he and his wastepaper basket are almost completely submerged in material, some suitable and some not, some extolling the virtues of this and that product, in an attempt to gain free advertisement and some being the products of established and potential journalists, some on the staff and some in the jungle inhabited by free lances.

Publications in general are a commercial undertaking and, as such, are run on business lines and run to make a profit. And it is from the advertising revenue—the paid-for space—that such profits arise. Without this financial support most publications would cease to exist.

Sooner or later then, if mushrooms are to continue to command the amount of publicity which the size of the industry must inevitably demand and which, from an economic point of view, is rapidly becoming more desirable, a far more amount of paid-for space than is at present being taken will have to be budgeted for. Once this payment is made then more editorial space will immediately become available. There is nothing at all unethical about this—publications are like people, they must have money to survive.

A publicity campaign which relies almost solely on Public Relations, no matter how skilfully operated, cannot ever be fully effective. It is like a four cylinder machine trying to operate efficiently on two.

This publicity effort of ours must be a two pronged affair if the full benefits are to be realised. WRA

WHO'S WHO

Dr. Werner Arnold

Widely known and acknowledged throughout the world of international mushroom growing, Dr. Werner Arnold, Head of the West German Mushroom Institute of the D.D.R., and Honorary Member of the MGA, celebrated his sixtieth birthday in May.

Dr. Arnold, who visited this country in 1957, has for many years occupied a leading position in horticulture in his country. He first began his close association with mushrooms when, in 1955, he was made Scientific Assistant at the Martin Luther University Institute for Fruit and Vegetable Culture, Halle-Wiltenberg. From that year he also became head of the research department for mushrooms at Halle-Dieskau where, since 1956, he has been Director.

Dr. Arnold, who was born in Frohburg in the Kingdom of Saxony, served in the German infantry in the 1914-18 war. He was student horticulturist at Leipzig University where he was later to become Scientific Assistant. It was in 1937 that he became Head of the Horticultural Department for the Leipzig Region and later for the whole of Saxony.

SEEN THIS?

From Denmark comes the BURUP system of large capacity ventilation, constant air movement and induced humidity by means of large wood-wool mats, soaked in water.

Much attention has of late years, been paid to ventilation and air movement in growing houses and various attempts have been made from time to time to reach a satisfactory conclusion on the matter of humidity.

It is claimed on behalf of this system that it is most effective in keeping houses cool during spells of hot weather and the system is said to be popular both in U.S.A., and on the Continent. It is comparatively new to this country. Bellanger Bros. Ltd., of 306 Holloway Road, London, are the sole concessionaires for the U.K., and Eire.

NEW SUNDRIES COMPANY EXPANDING

Northern Horticultural Supplies of Russell Street Chambers, Bingley, Yorks., formed a few months ago by Mr. G. Hardwick, announces that the Company has been appointed sole distributors of Pinkerton's Spawn, produced at Millerston, Glasgow. Mr. Hardwick planned to be in Holland and Denmark this month with a view to increasing the spawn exports to these countries.

The Company, which handles a wide range of sundries, including the Culverwell Manure Turner, Shirley Activators, Viking Peat and so on, has, according to Mr. Hardwick, made considerable progress of late. He said " We are doing better than we expected and we aim to specialise in prompt deliveries ".

PART V (1)

STUDIES ON THE INFLUENCE OF CARBON DIOXIDE ON THE CULTIVATED MUSHROOM

By **Dr. H. J. Tschierpe**

Institut für Gemüsebau der Technischen Universität Berlin
Direktor Prof. Dr. H. Riethus

(The original paper was published in "Die Gartenbauwissenschaft 24, 1, 18-75, 1959)

D. Experiments on the influence of carbon dioxide on the fruitbody form

The factors influencing the sporophore initiation of the hymenomycetes are not known. One supposes from abnormalities often observed and described in sporophores, grown under special conditions (cellars, caves, etc.), that external factors are not without influence (**Maheu**, 1906, 1926; **Spaulding**, 1910). Light as well as aeration have a morphogenic influence on the fruit-bodies (**Borris**, 1934; **Stiefel**, 1952; **Plunkett**, 1956). Aeration can act by increasing transpiration from the sporophore (**Schenk**, 1919; **Hopp**, 1938; **Plunkett**, 1956) and on the other hand, the CO_2-content of the air surrounding the sporophorese which is changed by aeration, can have a morphogenic influence, (**Plunkett**, 1956; **Kindt**, 1958). Studies of the factors which cause sporophore abnormalities are important because, with the recognition of these factors one can draw conclusions as to the conditions which are necessary for normal development. It might be possible that by this " roundabout way " one could have a glance into the mechanism of fruitbody initiation.

Light and the relative humidity of the air have no morphogenic influence apart from this fact ; that at a low relative humidity (35%) smaller but normal shaped mushrooms appear than in an atmosphere with high (85—100%) relative humidity (**Mader**, 1943). With insufficient ventilation, however, volatile metabolic products can cause an elongation of the stipe and, at the same time, a retardation of the cap growth. **Lambert** (1933), **Mader** (1943), and **Stoller** (1945, 1952 a, b) tried to determine the substance responsible for this reaction. Because each of these research workers came to a different conclusion, a detailed discussion of their experiments seems to be necessary. **Lambert** (1933) blew different amounts of carbon dioxide, oxygen, and nitrogen into bell jars placed over growing mushrooms on a bed, and in this way changed the composition of the air under the jars. **Stoller** pointed out that the control plots in these experiments were not quite correct: the mushrooms on the control plots grew without glass cover in normal room air and were therefore not only exposed to an air of different composition but also to a different humidity and therefore different transpiration conditions. **Lambert** found that a CO_2-content of more than 5 (volume) per cent can cause abnormal growth, growth inhibition and even the death of sporophores, and that about " 1 per cent of carbon dioxide was the lowest concentration that was noticeably injurious ". The author himself points out, that " with the comparatively crude methods used for maintaining and determining the composition of the atmosphere, it was not possible to establish precisely the limits of

carbon dioxide and oxygen concentration tolerated by the mushroom ". Under precise consideration of his results it becomes evident that the " border-concentrations " (1 and 5 per cent CO_2) mentioned by him could only be rough approximate data. For example, mushrooms were killed by 5 days exposure to a CO_2-concentration of 7.2 to 9.4 per cent and 8.0 to 9.6 per cent (experiment 4). An obvious elongation of the stipe occurred even at a CO_2-concentration of 0.6 (volume) per cent CO_2 (experimental series No. 5, fig. 5 F). Apart from the already mentioned not quite correct control plots, the value of the results is limited by heavy fluctuations of the CO_2-concentrations under the bell jars (experiment 1 D : 10.8—20.0 per cent; experiment 2 B : 0.2—1.0 per cent; experiment 5 B : 0.2—1.0 per cent CO_2). Furthermore an exact judgment of his results is limited by the fact that the state of the treated mushrooms at the beginning of the treatment is not described. From the comparison between the four " largest mushrooms in treated clumps with untreated clumps having apparently an equal chance at the start " one does not know the size of the mushrooms at the start. In spite of these limitations Lambert's experiments show clearly that low CO_2-concentrations have a morphogenic influence on the fruitbodies, that their growth can be completely stopped at high CO_2-concentrations and that the sporophores can even be killed by carbon dioxide.

Stoller (1945, 1952a, 1952b) cultivated mushroom mycelium on composted horse manure in two-gallon earthenware pots. After appearance of the first sporophores he placed bell jars over the pots and made the connection between pot and bell jar airtight. All the bell jars had openings at the top, and one bell jar had one opening at the top and one at the side:

Pot 1: bell jar with opening (diameter 5.5 cm.) at the top.

Pot 2: bell jar with opening (diameter 3.0 cm.) at the top.

Pot 3: bell jar with opening (diameter 3.0 cm.) at the top and an opening on side of bell jar near bottom of bell (diameter 1.5 cm.).

Pot 4 and pot 5: no bell jar, placed in room air.

All the openings were left open throughout the experiment.

After six days CO_2-concentration under the bell jar over pot 1 was 1.2 per cent, under the bell jar over pot 2 4.0 per cent. The CO_2-concentration under the bell jar over pot 3 was " zero " per cent (**Stoller,** 1945, pp. 79-84, Table 12, Fig. 7). The most severe malformations (very long stalked mushrooms with tiny and closed caps) occurred in pot 2. The malformation also occurred in pot 1, but was not so distinct. The stalks of the mushrooms in pot 3 were likewise elongated " although to a lesser degree than when the carbon dioxide concentration was over 1 per cent " (**Stoller,** 1945, p. 82). Normal shaped mushrooms developed only on the pots not covered with bell jars.

In further experiments under the same conditions Stoller studied the influence of different currents of fresh air on fruitbody form. When the current flowing through the bell was 0.11 liters per minute the CO_2-

concentration under the bell jar was 0.4 to 0.6 per cent (pot 21). Also in this case the stalks of the three sporophores growing in the pot were elongated and growth of the pileus was retarded. When the air current was increased to 0.22 l. per minute (pot 22), the CO_2-content in the bell jar was only about 0.2 volume per cent and the three mushrooms in the jar were normal. When the air current was increased to 0.67 (pot 23) and to 1.1 l./min. (pot 24) both normal and abnormal sporophores developed. These pots, however, grew 9 sporophores each. In pot 25 2 normal sporophores grew in an air current of 1.67 l./min and also in pot 26—without bell jar—normal mushrooms grew. From these experiments Stoller comes to the conclusion that carbon dioxide cannot be responsible for the fruitbody abnormalities, because

1. An elongation of the stipe can also occur " in the complete absence of carbon dioxide in the atmosphere " (pot 3).
2. At an air current of 0.11 l./min in the bell jar only 0.4 to 0.6 (volume) per cent carbon dioxide could be detected and sporophore abnormalities occurred though " according to Lambert (1933) this concentration would be too low to cause elongation of the stipe " (p. 91).
3. An elongation of the stipe can also occur when the air current is 1.1 l./min, and only 0.4 per cent CO_2 are detectable and also when " no carbon dioxide is present, but . . . a large number of mushrooms " develop.

Stoller supposes the existence of an unknown volatile substance and he even considers that his results form a basis to draw conclusions as to the chemical and physical properties of this substance.

On careful consideration of his experiments and the conclusions drawn from his results, it becomes evident that—considering the error of the Orsat apparatus he used in ranges below 0.4 (volume) per cent—his results not only do not disprove the morphogenic CO_2- influence but they actually do prove this influence. It seems very risky to us to speak about a " complete absence of carbon dioxide " if one cannot determine CO_2 with the Orsat apparatus. The CO_2 concentrations important in the life of the green plants are also much lower than those measurable with the Orsat apparatus.

If one puts a bell jar with two openings (pot 3) over a mycelium-impregnated organic compost, there must be under the bell jar at least the same CO_2-concentration as in normal fresh air. To that is added the carbon dioxide that is continuously produced by the compost and the mycelium, so that the CO_2-concentration might be low but at any rate must be higher than 0.03 volume per cent.

As **Schisler** (1957) proved, growing mushrooms give off considerable amounts of carbon dioxide. According to that also Stoller's results with different air currents may be considered as mere CO_2 effects. In the pots with 9 sporophores (pot 23 and 24) there must have been relatively high CO_2-concentrations, but they were not detectable with the Orsat. If only two or three mushrooms grew under the bell jar a slower air current was sufficient to carry away the harmful carbon dioxide.

In both experimental series in which Stoller described " CO_2-absence ", the CO_2-concentrations must have been between 0.03 and the lowest concentration significantly measurable with the Orsat apparatus (approximately 0.4 volume per cent). The inaccuracy of the CO_2-determination in the lower ranges might have led to the suggestion of the existence of another morphogenic substance.

Mader (1943) carried out experiments (" a project of the research department of Yoder Bros.") both on fruitbody initiation factors and on factors influencing fruitbody shape. In one experimental series he cultivated mycelium on composted horse manure in special trays (10 sq. ft.) and placed these trays after casing in special growing chambers (capacity 12 cu. ft. each), made of a wood frame and glass sides. With small air pumps (2 cu. ft. capacity per minute) the air was washed at 6-hour intervals for 20 minutes through various air-washing equipments. For air-washing and absorption of the supposed unknown volatile substances the following materials were used: alkaline potassium permanganate solution, activated charcoal, mineral oil, and sulphuric acid. One experimental series consists of a set of three chambers. The air in chambers 1 and 2 was circulated at the intervals mentioned, chamber 3 did not receive any washing. In those chambers, whose air was pumped through CO_2-absorbing materials (charcoal, alkaline potassium permanganate solution) normal sporophores developed. In the chambers without air-washing no sporophores developed but a heavy surface growth of mycelium took place on the surface of the casing soil.

If trays with sporophores already formed were placed in chambers without air-washing (series 4, experiment C, tray a) no further sporophores formed. " Some of the fruitbodies present developed into mushrooms of gigantic proportions. The length of stipe was about 2 to 3 times that of mushrooms grown outside. It was swollen at the base and of dumb-bell shape. The pileus was abnormally large, mishappen, and not as symmetrical as that of a normal mushroom. Some fruitbodies had a small pileus resembling those formed under conditions having a high CO_2-concentration in the atmosphere . . . other fruitbodies remained " seated ". They bulged, onion-like at the base. Mader's methods have already been criticised by other authors (**Stoller,** 1945, 1952 a; **Schisler,** 1957) and there exist doubts about the validity of his conclusions. Mader's chambers could not have been airtight as he maintained. With air-washing through CO_2-absorbing materials (alkaline potassium permanganate solution, charcoal) CO_2 is absorbed and on the other hand oxygen is used up for CO_2 formation, i.e., a partial vacuum must have appeared, caused by the removal of carbon dioxide and oxygen. Mader does not mention any partial vacuum and no oxygen supply. Furthermore he did not carry out CO_2-determinations in his chambers. From the materials used for air-washing he concludes that the supposed unknown volatile substance is an unsaturated hydrocarbon, which can be removed with charcoal by absorption, with mineral oil by solution, and with alkaline potassium permanganate solution by oxidation. A normal fruitbody development,

however, only occurred when the air of the chamber was washed through alkaline potassium permanganate solution or charcoal (both do absorb carbon dioxide). If the air was washed through mineral oil abnormal fruitbodies developed.

The alkaline potassium permanganate solution used by Mader was made of " 3 lb. of sodium hydroxide plus 2 ounces of potassium permanganate per 5 gal. of water ". It is incomprehensible to the author that Mader makes responsible for absorption of the unknown substance the relative low amount of potassium permanganate in this solution and that he does not take into consideration the very high amount of CO_2-absorbing sodium hydroxide. In order to prove that the unknown volatile substance is oxidized by $KMnO_4$ he ought to have used pure $KMnO_4$-solution, without any CO_2-absorbing material. He did not carry out such an experiment.

Fom **Mader's** experiments one can only see that for fruitbody formation a CO_2-poor air seems to be necessary, that carbon dioxide has a morphogenic influence on growing sporophores (Series 4, experiment B, chamber 2; experiment C, chamber 3), and that where an accumulation of volatile metabolicm products is possible (chambers without air washing), no sporophores are formed but a heavy surface growth of mycelium occurs. The existence of the unsaturated hydrocarbon and its morphogenic influence however, are not proved with **Mader's** experiments.

Kindt (1958a, b) mentions that CO_2-concentrations of more than 0.3 to 0.5 volume per cent could have a morphogenic and quality reducing effect on mushroom sporophores. Because **Kindt** does not mention any methods in his paper it is not possible to repeat his experiments.

The experiments described in this paper were carried out in order to test the different hypotheses and in order to determine whether and in what concentrations carbon dioxide has a morphogenic infiuence on growing sporophores.

Fig. 12 Experimental jar for cultivation of sporophores

S=compost filled jar.
K_1, K_2=culture jars.
E=inlet opening for air.
A=outlet opening for air.
R=capillary tube
G=strip of porus gum.
D=casing soil.

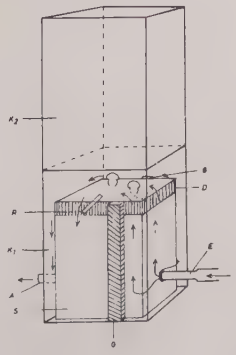
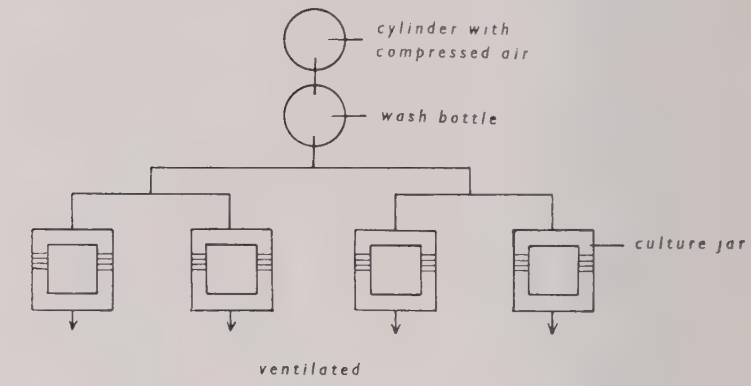
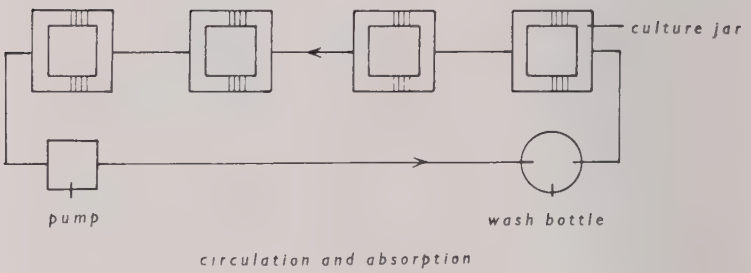
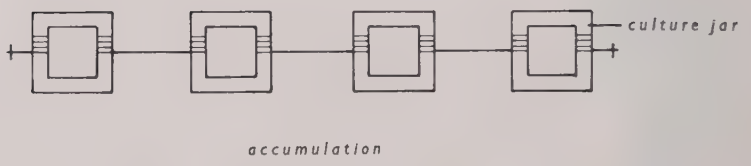


Fig. 13 Scheme of Experiments







2. Methods

Short composted horse manure was filled after phase I in polystyrol containers (9 × 9 × 11.5 cm.) and "peak-heated" under commercial conditions. After having finished phase II each container was spawned with 25 grains of grain spawn. Spawn running took place at 25° C. and 14 days after spawning the containers were cased with a 1.5 to 2.5 cm. layer of loamy sand. Then the temperature was decreased to 16 to 18° C. The transparent walls of the container made it possible to watch the growth of mycelium, the formation of strands and sporophores near the wall.

The different treatments started when the first sporophores had "pinhead" and "button" size. For that a compost filled container (S) was put into a bigger (10.5 × 10.5 × 15.0 cm.) polystyrol container (K_1). This was fitted with 2 tubes, 8 mm. diam. on opposite sides, 3 cm. above the bottom, one tube for air-inlet (E) and one for air-outlet (A). A capillary tube (R) for air sampling was fitted in the third wall 12 cm. from the bottom. On to this jar a second jar of the same size (K_2) was inverted and sealed with a gummed foil (see Fig. 12). Four such containers were fitted together with PVC tubing for each treatment in different ways (see fig. 13).

In many cases the containers were ventilated with air of a certain CO_2-content. This air was produced as follows: pure carbon dioxide was filled from a commercial cylinder into an empty cylinder of compressed air (capacity 40 l). The desired amount was determined from the pressure (1 atm. = 40 l.); then the cylinder was filled up with compressed air to a pressure of 100 atm. (= 4000 l.). In this way it was possible to produce "air" with every desired CO_2-content. The relative decrease of nitrogen and oxygen, due to the increase of carbon dioxide was neglected. The air was renewed ten times per hour in each jar. The route of the air stream was the same in all cases: from the air cylinder through one or two gas-wash-bottles—distribution by T-pieces—bouncing on the wall of the small container opposite of the air-inlet-tube-flow out into the room air. Two strips of porous gum (G) prevented the air flowing round the sides of the inner jar so that the air, before discharging into the room, had to go over the whole casing soil surface. The direction of the airstream was observed by means of smoke.

CONGRATULATIONS

The MGA offers its warmest congratulations to Mr. Henry Haynes, Senior Horticultural Secretary of the National Farmers' Union who was awarded the M.B.E. in the Queen's Birthday Honours List. Mr. Haynes, who has been a tireless worker for horticulture over many years, has also been a particular friend of mushroom growers. His is an award richly deserved.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PROGRESS WITH "WATERY STIPE"

Doreen G. Gandy

Glasshouse Crops Research Institute, Littlehampton

It was a great misfortune that at the height of the 1957 outbreak of " La France/Brown disease/Watery Stipe " no facilities existed for a systematic investigation of its cause and cure. By the time a start could be made the disorder had all but disappeared, but as many growers still fear a large scale return of the trouble, work continues on this difficult problem.

The name " Watery Stipe " is being used to describe this disorder, but it is not intended to be as specific as, for example, *Mycogone*, which is the proper name of an organism causing a particular disease. Until the whole problem has been unravelled it is not possible to define exactly the terms which have been used in describing outbreaks.

The first object of this investigation was to find out whether the disorder could be transmitted from one crop to another. Compost and casing were obtained from crops suspected of having the disorder and were placed in trays of spawned compost. The most consistent subsequent reaction was a great reduction in cropping. Many of the mushrooms produced were of poor quality, showing at least some of the symptoms described by growers. In addition, the mycelium disappeared from the compost quite early in the cropping period. This could not be attributed to pests as the numbers present were too few.

When instead of inoculating plots with material, they were treated with water extracts of such material which had been filtered to remove fragments of mycelium but not bacteria, the resulting crop of mushrooms was normal and the mycelium remained in the compost until the end of the experiment.

The question of the rate of spread has been the subject of controversy, and some information on this has been obtained. Shelf beds were constructed, containing plots measuring 12 × 4 ft. " Diseased " compost was inserted in the middle of each and the positions of mushrooms plotted as they appeared. When the beds were inoculated at spawning, no mushrooms appeared within two to three feet from the site of inoculation. The bare areas increased with each successive flush and many of the mushrooms appearing at the edges of these areas were abnormal. In beds inoculated at casing time, the bare areas were smaller, and in those inoculated at the time of the appearance of the first pinheads no abnormal mushrooms appeared until the second flush. When more data have been obtained it should be possible to determine whether there is any relationship between the rate at which the disorder spreads and the stage at which infection occurs.

These cropping experiments have yielded much useful information, but cropping houses are not suitable for very critical experiments. These must be done in the laboratory, and they bear little resemblance to conventional mushroom growing. On an agar medium under sterile

conditions, the mushroom produces fluffy white mycelium with thicker strands (rhizomorphs) radiating from the centre of the colony. (Plate 1). During the course of the cropping experiments described, small pieces of mushroom mycelium were taken from the plots at different times and placed on malt agar. These fragments often failed to grow because the mycelium had degenerated. However, when the mycelium appeared to be in good condition, it grew, but the resulting cultures were of two distinct types. Some were as described above, but others were abnormal, the mycelium being adpressed (not fluffy), buff coloured, without rhizomorphs and very slow growing. (Plate 2.) In one experiment the first mycelial isolations were made immediately before the plots were inoculated with compost. On that occasion all the resulting cultures were normal, but when the next isolations were made two weeks later some of the cultures were abnormal. Thereafter, with each successive series of isolations, more abnormal cultures were obtained. The cultures from the control plots remained normal throughout, there being no apparent loss of vigour, despite the greater number of mushrooms produced by these plots. This technique of mycelial isolation was used to trace the spread of the disorder on the large shelf beds. It was not possible to recognise mycelial degeneration by a cursory examination of the mycelium in the compost, for it still appeared healthy when these abnormal cultures were obtained. Mycelium taken at a later stage, when degeneration was obvious, always failed to grow. The loss of vigour of the mycelium is apparently so great that it is unable to compete with pests and other organisms in the compost. That the infective agent does not kill the mycelium is shown by the fact that the latter remains alive under sterile conditions where there is no competition from other organisms. Abnormal mycelium can be grown on sterile compost, but when the spawn so made is put into ordinary compost it usually fails to establish itself.

This mycelial abnormality was the first clue obtained as to the cause of " Watery Stipe ". If transmission of the disorder could be obtained by inoculating a mushroom bed with " diseased " material, what would happen if a normal and an abnormal culture were grown together on agar in a Petri dish? This was done, discs of the two types of mycelium being placed about one and a half inches apart. Control dishes were inoculated with two healthy but not necessarily identical cultures. Both of these grew vigorously and after they came into contact with each other many of their rhizomorphs fused. With a normal and an abnormal culture, however, there was no obvious fusion of the two cultures. There was no change in the appearance of the old mycelium of the normal culture after the two colonies had met, but subsequent growth was weaker. If any mycelium from this colony were removed and grown in isolation, its new growth was slow and abnormal, thus showing that the " disorder " had been transmitted. Transmission was also obtained by dipping discs of healthy mycelium in suspensions of macerated abnormal mycelium. If these suspensions were filtered to remove the mycelium, no transmission took place. This confirmed the results of the first transmissibility tests, in which inoculation with compost and casing transmitted the disorder

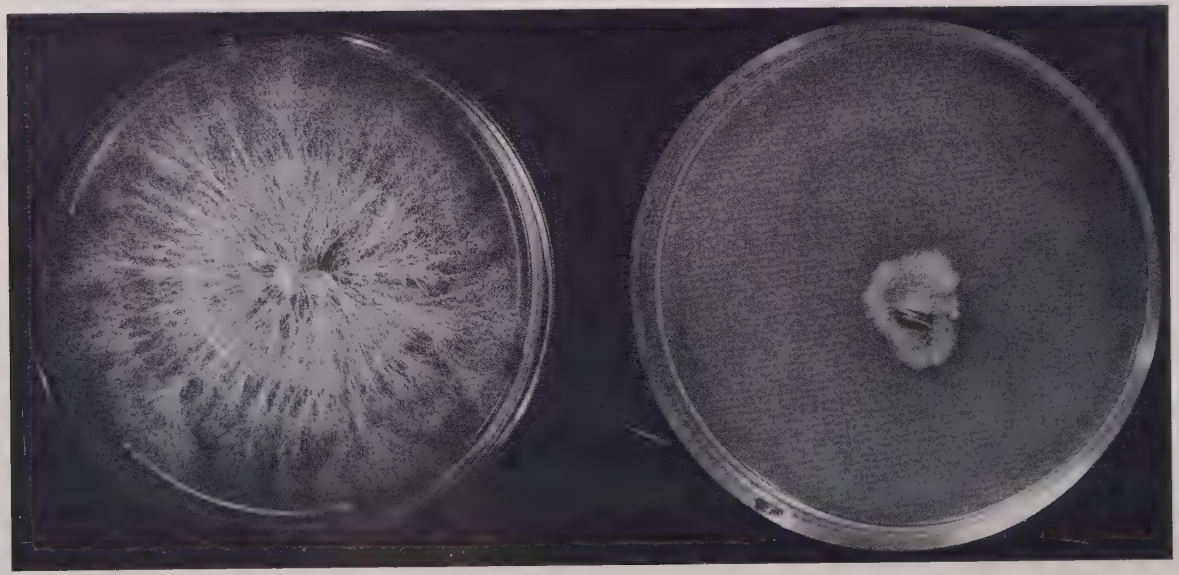

PLATE 1

28 day old culture showing normal type of mycelial growth. Isolated from a plot two weeks after spawning and inoculation.

PLATE 2

28 day old culture showing abnormal type of growth. Isolated from the same plot as in Plate 1 but two weeks later.

but filtered water extracts of the material did not.

When spawn grown from an abnormal and a normal culture were mixed together and inoculated into trays of compost, the resulting crop was very small or non-existent, showing that the presence of the abnormal culture prevented the normal one from cropping.

Microscopic examination of abnormal cultures has failed to reveal the presence of any pathogen. Treatment of cultures with rose bengal, a bactericide, did not improve growth.

High temperature greatly affected abnormal cultures. At 25° C. growth was as previously described, but at 33° C. growth rate increased and fluffy mycelium was produced. When some of this fluffy mycelium was isolated and then grown at 25° C., the resultant culture appeared normal and transmission tests were negative. Heat treatment appeared to retard the spread of the infective agent into the young mycelium; for the original adpressed mycelium remained unchanged. At 35° C. abnormal mycelium was killed and failed to transmit any abnormality to healthy cultures, thus showing that toxins were not responsible for culture variations. The fact that dead mycelium does not transmit the abnormality has an important practical value as it shows that heat is an effective means of disinfecting a contaminated house, providing that it is properly applied.

This investigation on " Watery Stipe," although far from complete, has now shown that there exists a transmissible disorder of mushrooms causing great reduction in yield, deterioration of the mycelium and the production of distorted sporophores. Positive identification by examination of the sporophores is impossible as the symptoms are too variable. The presence of watery streaks in the stipes is not a reliable guide, for many healthy mushrooms have them. Identification can at present only be obtained by making mycelial isolations from affected crops and testing the resulting cultures. If a culture cannot be obtained, owing to the deterioration of the mycelium, identification is not possible. The tests reported were applied to samples obtained from unsatisfactory crops within recent months, and abnormal cultures were obtained from several. Unfortunately it takes about six weeks for the full cycle of tests to be completed, and it is most desirable that a more rapid means of identification be found.

How much nearer are we to discovering the cause of " Watery Stipe "? A bacterium or fungus seem to have been ruled out, leaving a virus or a genetical disturbance as the most likely causes. Since the dividing line between these two is not well defined, and they can even be regarded as two aspects of the same problem, the field has narrowed considerably. Future laboratory work will explore these possibilities.

Is " Watery Stipe " the same as " Mummy disease "? Some of the symptoms are similar, but there are differences in behaviour which make it unlikely. According to Kneebone, cultures of mycelium from crops with " Mummy disease " are normal in appearance.

The question of the effect of environmental conditions on the incidence of abnormal mushroom fruiting bodies is an important one

which is soon to be investigated in the new controlled environment chambers at the G.C.R.I. It seems fairly certain that under some conditions, still largely unknown, mushrooms may be produced which are very similar to those found in association with spawn degeneration.

If an outbreak of " Watery Stipe " occurs on a farm, precautions should first be taken to limit its spread. It is not yet known whether the disorder can be transmitted by contact with abnormal mushrooms, but it would be a wise precaution to see that pickers do not touch them. A carry-over of the disease can be prevented by an efficient cook-out, for it has been shown that dead mushroom mycelium does not transmit the disorder. If this is not done, any fragment of affected mycelium is probably capable of starting a new attack.

My Way of Growing

SHACKLEFORD NURSERIES

Deep Shelf Beds—Two Crops Per Year

Shackleford Nurseries, home of Mr. P. B. Stanley-Evans, this year's MGA Chairman, is another of those nurseries which are situated amongst delightful countryside—this time near the Hog's Back in Surrey where, at Eashing, Mr. Stanley-Evans has about 20,000 sq. ft. of mushroom beds in production at peak time—between August and April.

Shackleford Nurseries is not solely concerned with mushrooms—far from it—for the nursery contains about 100,000 chrysanthemum plants, about 10,000 tomato plants, tulips, and also lettuce in season.

Mr. Stanley-Evans first became interested in mushrooms when, following a year at Wye Agricultural College, he became a nursery hand in the Worthing Area in 1934 and later nursery manager.

During the Second World War he was a Major in the 7th Queen's Own Hussars and in 1947, following a fruitless search for a suitable nursery site, he decided to establish one in his father's four-acre garden. His first crop of mushrooms was in a permanent dutch light structure containing about 6,000 sq. ft. of bed space." I was extremely fortunate to crop 3.42 lb. per sq. ft. that first time and for the following five years I averaged $3\frac{1}{4}$ lb. per sq. ft., but " he added wryly " I don't get those figures now."

Not by any stretch of imagination can the mushroom growing units at Shackleford be described as modern but the simple truth remains – that, by results, they have proved time and time again to be quite effective and economical.

The nursery contains only two purpose-built mushroom growing houses, each constructed of asbestos (double skinned) with fibreglass providing the insulation, plus air cavity. Natural roof and ground ventilation is favoured and although these two houses have extractor fans, they are rarely used. These two houses, each containing 3,000 sq. ft. are the only two on the nursery which are used exclusively for mushroom production. The remainder of the production takes place in adapted glasshouses in which one crop of 14 weeks picking is taken

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every three years, alternating with tomatoes and chrysanthemums.

Old army camp beds lined with newspaper provide the shelves, the majority supported by their original legs although concrete blocks are needed here and there. The air to bed space ratio is very high and, in these adapted glasshouses the insulation is provided by a covering of wheat straw and, says Mr. Stanley-Evans, " the insulation provided by about four inches of straw, just thrown up on the roofs and secured only at the ends, is slightly better than that of the purpose-built houses."

Two types of glasshouse structures are in use: the permanent dutch light structures measuring 145 ft. by 30 ft. and taking about 6,000 sq. ft. of bed space, and the mobile dutch lights measuring 140 ft. by 10 ft. and taking 2,000 sq. ft. of beds. The average depth of the bowed beds is about 10 inches, less near the edges but deeper in the centre.

The composting shed is completely open down one side. Stable manure forms the compost basis with $1\frac{1}{2}$ tons of battery chicken manure added to every ten tons of stable manure at the first turn followed by 1 cwt. of gypsum to one ton of manure at the second turn. For years a long compost of 28 days was in operation but recently a change was made to the Sinden two-phase short composting technique described in " Science 2 ". The important second phase is completed in the growing houses where low pressure steam, gilled piping and the addition of coke braziers in the critical period sees the air temperature rise to 150° F. where it is held for about three hours. Manure spawn is used because, says Mr. Stanley-Evans, " I find that whilst grain spawn gives me the heavier crop over a period of six weeks picking manure spawn beats it over the twelve weeks and provides me with a very good quality mushroom." The usual insecticides are in use for fly control and cooking-out between crops is rigidly practised in the purpose-built sheds. Spawning takes place when the temperature has dropped to well below 80° F. and a slow spawn run with a bed temperature of about 62° F. is aimed at. " For my system I have time for a picking period of three months and this spawn run plus the deep beds fits in just right," Mr. Stanley-Evans said. Growing temperature is 60° F.

On this nursery there is no " leaving it to Charlie " for Mr. Stanley-Evans does all the mushroom watering himself for the first 2 months and this enables him to inspect, at least twice every week, every sq. ft. of mushroom bed in production. Any suspected disease is quickly isolated as much as possible, by trenching through the bed and completely wrapping the affected part in polythene, after quick treatment with formaldehyde. Formaldehyde is also used for control between crops and so far no serious disease has developed apart from an attack of *Verticillium* a few years ago.

Peat and lump chalk, in equal parts (volume) are used for casing, which takes place 3—4 weeks after spawning.

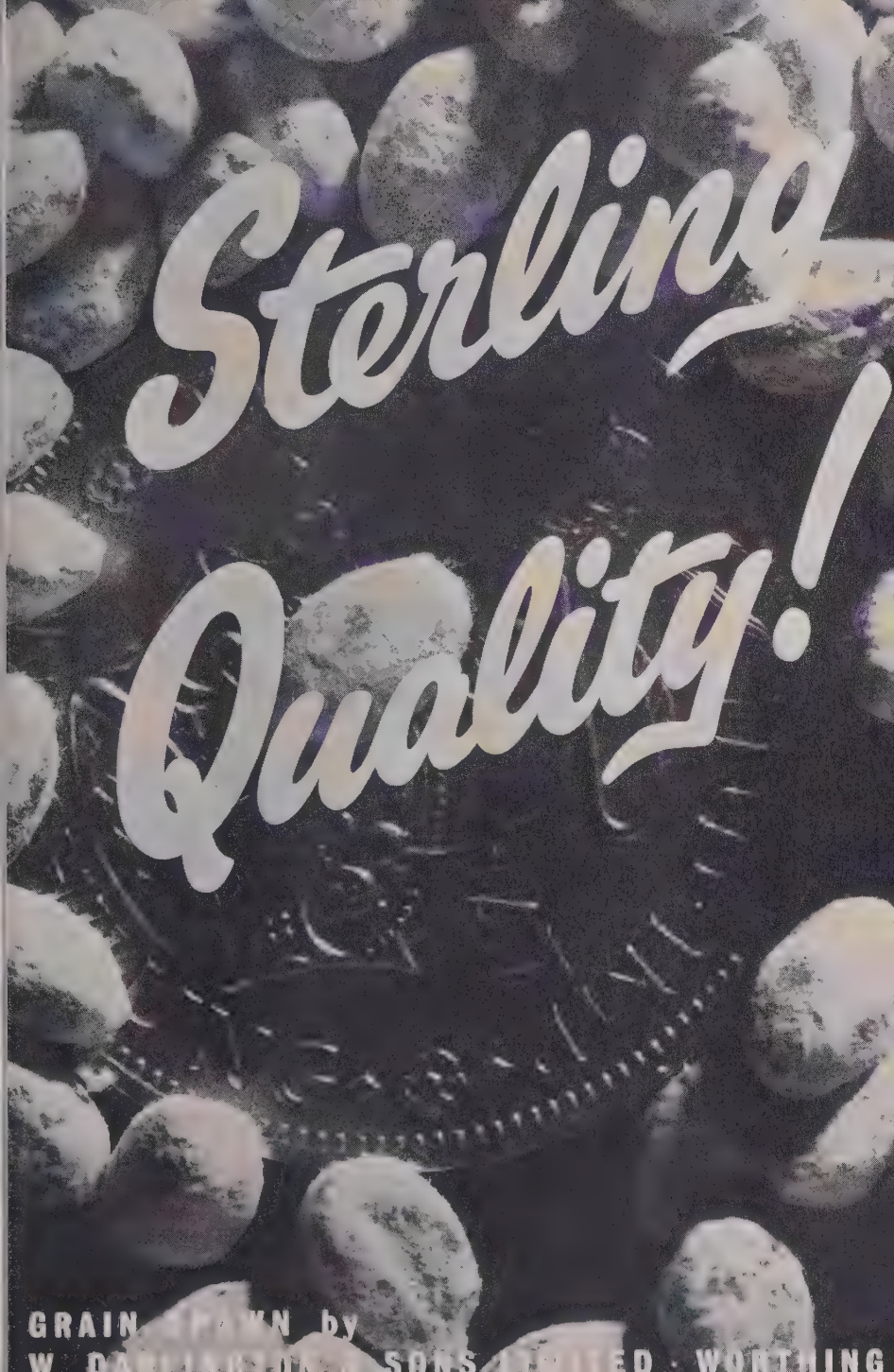
Marketing presents no problems at all for half the production from the nursery is marketed direct to wholesalers, three of whom, although they each send a lorry to Covent Garden every day, cheerfully make a special round journey of 20 miles in order to pick up their mushroom supplies at the nursery. The mushrooms are picked as late as possible the day before and this direct collection can start as early as 7 a.m. next morning.

Whilst Mr. Stanley-Evans believes that a lowering of production during the months of low prices could benefit the industry as a whole, he himself admits that whilst reasons of economics influence him in cutting his own mushroom production by half in the summer months—the half keeps his local sales on the go—it also suits his general nursery system as well. He finds that provided cups and large flats are of good quality—and he specialises in very heavy good quality mushrooms—there is little difference in the price returns and he fixes his local sales to agree with the price returns on the wholesale markets.

Somewhat modestly, he says of his mushroom enterprise " I feel that my lay-out and my methods are perhaps somewhat antediluvian but when I hear of some of the troubles which growers with more intensive methods run into, I am not tempted to change although I certainly intend to mechanise wherever possible." He added " I am lucky with my staff, many of whom have been with me a long time and all of whom take the keenest interest in the business as a whole, and I am lucky too, to have my father as Joint Managing Director. He is a retired Chartered Accountant and he looks after all the facts and figures and saves me an awful lot of trouble and produces illuminating statistics."

What about " shake-up " and " through-spawning?" " Well " he said, " I find that with ' through-spawning ' there is a significant increase in yield over a six week cropping period but there is a decline if I take it through to my 12 weeks picking, but with ' shake-up ' I gain from one-eighth to one quarter of a lb. per sq. ft. per crop." Finally, he said " This set-up of mine, with mushrooms forming a part of a general nursery enterprise suits me, and this way is proving economic. Of course all mushroom farms are not the same and what suits one does not suit another. Obviously, this natural ventilation of mine—my glasshouses, especially, let in air at all points of the compass—would not suit a farm constructed absolutely of purpose-built houses, but it does suit mine." Judging by the quality of mushrooms, both on the beds and in the packing shed, it most certainly does. Note for those who may be puzzled as to how " shake-up " spawning is effectively managed at Shackleford Nurseries. A Tarpen rotatiller is used—an electrically powered piece of equipment which has a variety of uses, like drilling for instance. It can be fitted with rotating blades and handled comfortably by one man. It ploughs through the mushroom beds and thus brings about the required shaking up. Production is between $2\frac{1}{2}$ lb. and 3 lb. per sq. ft. per crop " and I aim to get $3\frac{1}{2}$ lb. It's in the compost and it's up to me to get it," says the MGA Chairman.

WRA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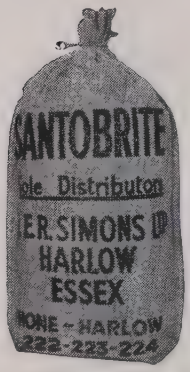

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MUSHROOM RESEARCH AT LITTLEHAMPTON

The extent of mushroom research which is now being carried out at the Glasshouse Crops Research Institute, Littlehampton, under the watchful eye of the Director, Mr. F. W. Toovey, was explained to growers at the Institute's Open Day which took place in May following a special " Press Day " earlier.

Among other things, growers were introduced to "CATHIE" which, housed in a disused boiler room, is being used to conduct a number of experiments into controlled environment, including air movement and humidity.

Elsewhere in this issue Miss Gandy describes the interesting progress which is being made into " Watery Stipe " disorder and the control possible by a thorough cooking out of houses between crops. The official report also states " It has still not been possible to compile a reliable list of the sporophore abnormalities associated with ' Watery Stipe '. The strain of mushroom used in these and other experiments has shown a tendency to produce abnormal mushrooms under several different conditions. It has therefore become necessary to select, if possible, a strain which is more suitable for this investigation."

The report of the Horticulture department (Head—Mr. G. F. Sheard) refers to the continued work on the relation between water potential (moisture stress) and fruiting of the mushroom and which will include a study on salinity and, says the report, referring to 'CATHIE': " Eventually, the results obtained from these experiments should form a rational basis on which to make recommendations for the ventilation of growing houses, and should also provide useful information on some of the causes of deformed mushrooms, stroma and other physiological disorders."

From the statistics section is a note pointing out that there are often differences in the yield of experimental treatments, quite apart from any direct treatment effects, because the produce from each plot is not harvested at an identical stage of maturity. It is hoped, with the use of a simple mathematical model, to investigate theoretically the way in which the yield of certain crops changes with time. The growth rate and the influence on yield of harvesting mushrooms at different stages of maturity are also being studied.

On the Entomology side (Head—Dr. N. W. Hussey) studies are in progress on the unusual paedogenetic reproduction of the new mushroom-infesting Cecid *Henria psalliotae*. Cultures of various wood-rotting fungi are being tested as media for continuous reproduction of the four species of mushroom Cecids to provide information on possible natural reservoirs of these pests. The role of the compost environment as a factor affecting Cecid reproduction is being studied in small jar cultures. Investigations on the life-history of the eelworm *Bradynema*, parasitic on Phorids, are continuing.

In the actual mushroom houses the trapping of aerial fauna, including Cecids, Phorids and Sciarids, is continuous. A trial of different

methods of spawning, shake-up and super-spawning, will be laid down while a high population of Phorid flies is artificially introduced, to assess the relative hygienic values in different spawning methods.

A preliminary trial of increased spawning rate suggests that this leads to increased yields and this, and the stage of picking, are the subject of further trials. Manure spawn is being tried at varying rates between 1 pint to 6 sq. ft. and 1 pint to 48 sq. ft. and similar trials are going on with grain spawn. Production trials are also taking place on trays cased early and those cased at the usual time.

Trashing a Waste of Time

Recent trials have shown no significant differences in yield between beds which were trashed regularly and those which were not trashed at all. With a healthy crop, the results suggest that there is nothing to gain by trashing and that this time-consuming operation could be dropped.

2. Stage of Picking

The stage of development at which mushrooms are picked can have a marked effect on total yield. Beds picked at the " button " stage yield considerably less than beds picked when the mushrooms have developed into mature " flats ". Picking at the " cup " and early " flat " stages gave intermediate yields. The poorer prices obtained for mature " flats " partly cancel the effect of increased yield, but the economic advantages of later picking are worthy of consideration.

	STAGE OF PICKING			
	Buttons	*Cups*	*Early Flats*	*Mature Flats*
Yield after 10 weeks cropping (lb./sq. ft.) ..	1.76	2.11	2.29	2.53
Average price realised per lb. at this Institute	3/0d.	3/3d.	3/0d.	2/9d.
Gross Return per sq. ft. bed	5/3d.	6/10d.	6/10d.	6/11d.

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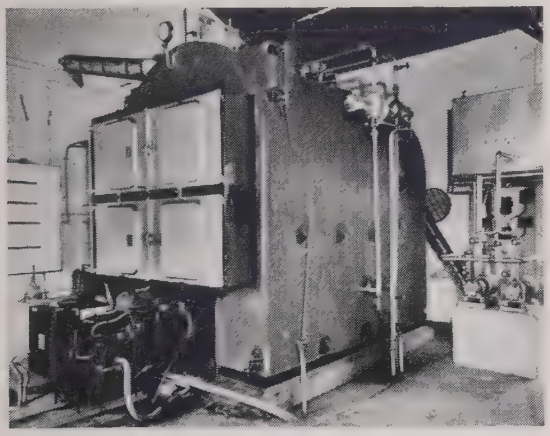

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210. Why, when mushrooms are graded into buttons, closed cups open cups and flats, do we assume an order of merit with buttons as best and flats as worst? Is there any justification for this assumption and its effect on price? If the average housewife were offered the four grades *at the same price* which would she choose? It seems to me that somewhere along the selling line someone is interested in creating a price differential based on visual impression, and it must be admitted that a well packed basket of uniform medium-sized mushrooms does look attrative. Salesmen know this and use it. It just shows how mad we moderns are; we fall for it -appearance first, taste last. Or do we, in fact? Nearly everyone I talk to prefers flats—" they taste better " but price and sales talk persist in suggesting to these people that they don't know their own minds or palates. I submit that buttons are best eaten raw (an uncommon practice) while for cooking the flatter and (within reason) older a mushroom is the better the taste. Ask a blind man about it. Perhaps, being a Yorkshireman, I have no " taste " in matters that do not concern taste.

211. F.P's June Calypso exhorts us to " run a loss " in summer. This requires no conscious or deliberate effort—it just happens! He adds that we should change to a lower gear and run the houses at a lesser pace (to achieve this loss, or prevent it . . . I'm not sure which). But this is easier said than done. I've tried for many years to find a way of cutting out growing for two or three months, but even a cursory examination of the problem indicates beyond doubt that the inevitable disorganisation of a scheduled routine, of labour, of manure supplies, etc., costs far more than a continuous production which includes a period of loss.

212. It seems to be assumed that the more efficient you make your *production* the more efficient your *business* becomes. Does it follow? You could become so efficient in your production that you would double your output, flood your markets, have to incinerate half your output, and reduce your publicity (advertising) aids. Your production would be so efficient you wouldn't be in business at all. Is that *business* efficiency? I am reminded that certain stockings were ladder-proof and looked like lasting for ever (Production efficiency). They soon put a stop to that by introducing *business* efficiency and making the things easily ladderable! The first fluorescent lamps made by a particular firm many years ago are still in use in their main offices. They are apparently indestructible, they won't burn out. It took 10 years to produce a lamp that was expendable and therefore profitable. Now, while our product is perishable, expendable, it is only profitable if it's saleable (at above cost, of course). Our *production efficiency*, in our present lamentable lack of knowledge, is pretty good, but we sadly lack the *business efficiency* which would positively protect or create profits.

If our MGA Executive had two extra sub-committees, one for Production Efficiency and the other looking after Business Efficiency, it would not lack excitement. I can imagine " Business " (between whom

and " Publicity " there would be a close liaison) at loggerheads with " Production " when the latter persuaded the Editorial Board to publish an article like last month's Active Mycelium Spawning. Grow more mushrooms, more quickly, *with less spawn*. The Production Efficiency lads would stick out their chests: "That's the stuff; we're giving 'em it straight and hot." " Business ", prodded by " Publicity ", would sting back, " Traitors! You're overloading the markets and cutting publicity contributions." The Editor would bleat that steps should be taken to guard against this and that, but things are after all better than we think. And one, at least, would claim that it's all very laudable, praiseworthy and inevitable. " Let's take the next item on the agenda, Gentlemen."

213. A visiting grower tried to convince me that it's easier to get a string of bad crops up than to improve good ones. Easier to find out what's wrong with bad crops than to find out how you can increase a high yield. Is it? I tried for two years to raise the yield of bad crops. Nothing and no one could help. A bad crop gives you no help, a series of them give even less. But good crops help themselves and their inherent health responds more readily to such cultural aids as we are able in our infinite wisdom to give. Or am I wrong?

214. Various reasons are given for seasonal differences in quality and pinheading ability and so on. Observations on our own farm — which may not apply everywhere because of climatic and humidity differences—seem to show that pinheading is easier and more plentiful in cold weather than in hot. Masses of small mushrooms of poor quality. When it's warm or hot pinheads are more reluctant, crops are poorer, but quality is very good. This prompts us to suppose that somewhere between the extremes is an ideal—the required number of pinheads to give a high yield of tolerable quality. Such conditions might prevail very approximately in parts of spring and autumn. Why? Merely because they're between summer and winter? I think not. For one thing spring and autumn humidities are vastly different. It must be something else. What about the possibility of optimum conditions being achieved at some (at present unknown) temperature difference between outside and inside the growing houses? Supposing, for the sake of argument, a temp. difference of 15° gave the maximum yield and satisfactory quality, would it pay us to hold this difference throughout the year, even if it meant inside temps. of 45° or lower in winter and up to 95° in summer? It may be argued that this would mean slow cropping in winter and quick in summer. What is the evidence?

215. Dr. Edwards' suggestion that more efforts should be made to induce retailers to increase turnover at less profit per lb. restates a problem that has exercised market gardeners for 30 years to *my* knowledge. You can't overcome human nature somehow. More pay for less work is a universal aim.

216. Talking of turnover, a motor dealer tried to sell me a car with this piece of sales talk: " More of these cars are turned over in Africa than any other make." I didn't buy.

PUBLICITY AND PUBLIC RELATIONS

Many members of the Association are probably not aware of all our activities in the publicity field and it has been suggested by both the Executive and Publicity Committees that a resumé of the Association's publicity and public relations work should be given from time to time in the *Bulletin*.

During the past two or three months members of the Association have provided mushrooms for cookery plays, mushroom weeks, cookery demonstrations and the Chelsea Flower Show.

Cookery Plays. Central Publicity Services last year organized two cookery plays, which are still touring the country. Since February these plays have been presented at Sale, Altringham, Widnes, St. Helens, Chorley, Lytham St. Anne's, Oldham, Birkenhead, Liverpool, Burnley, Kendal, Barrow, Rhyl, Wrexham, Bangor, Colwyn Bay, Gloucester, Cirencester, Middlesborough, Whitley Bay, Sunderland, Tynemouth, Luton, Norwich, Clacton and Bedford. Mushrooms are included in recipes in both plays and are supplied by the MGA.

Mushroom Weeks. Lewis's Ltd. (department stores) and their subsidiaries have held ' Mushroom Weeks ' in the following towns:— Liverpool, Manchester, Birmingham, Glasgow, Leeds, Stoke-on-Trent, Leicester, Bristol and Chester. Trays of growing mushrooms were provided for displays by members near these towns, viz., Agaric Ltd. at Bradford-on-Avon, Mr. D. J. Longhill at Leicester, Mr. Olverson at Ormskirk and Mr. Hugh Claxton at Knutsford, and many others who were contacted direct by Lewis's and whose names we don't know. The Association supplied each store with large and small ' M-m-m-mushrooms!' stickers, 'Month By Month' recipe leaflets and publicity paper bags.

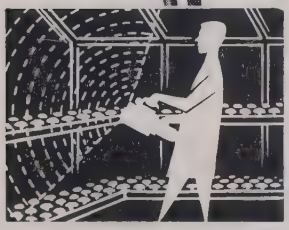
Apart from the Lewis's Ltd. group of stores, Mr. D. J. Longhill of Marigold Nurseries, Leicester, arranged for mushroom weeks to be held in shops in Leicester and Market Harborough.

Cookery Demonstrations. At the Birmingham ' Homes & Gardens Exhibition ', held from 30th March to 23rd April, and the Edinburgh Exhibition, held from 27th April to 14th May, mushrooms were used in cookery demonstrations entitled, " What's Cooking? " These Exhibitions were sponsored by the " Birmingham Mail " and " Edinburgh Evening News ".

Mushrooms were also used in cookery demonstrations at the Scottish Food Fair, from 19th April to 30th April, in Glasgow. Gift packs of mixed produce, including mushrooms, were presented to a member of the audience each day. These demonstrations were mainly arranged by the Potato Marketing Board and the Scottish Milk Board.

The Special Electrical Appliances stand used mushrooms in their demonstrations at the ' Ideal Homes ' Exhibition and at an Exhibition in Bournemouth.

Great News for Mushroom Growers



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Chelsea Flower Show. The MGA exhibited mushrooms on one side of the NFU stand at the Chelsea Flower Show in May. The exhibit took the form of a large mushroom shape, flanked by two smaller shapes, completely filled in with mushrooms. The mushrooms were set in peat in a box measuring 6′ × 4′ which was edged with turf. There chips, containing buttons, cups and opens, were displayed in order to show the public the different grades. Broadham Produce Co. kindly assisted with this display.

Journalists' Outing

One of the recent highlights on the Public Relations side was the outing to Fort Darland, Gillingham, for some fifty lady journalists. The journey from London to Gravesend was made on 9th June, by boat, on which cocktails and lunch were served, and from Gravesend to Gillingham the party travelled by coach. After inspecting Mr. Clifford's farm, the party had tea and returned to London by coach.

Wall Charts

In order to bring mushrooms to the notice of young people the Association has produced a wall chart and teaching notes for distribution to training colleges, showing the growing, preparation and cooking of mushrooms. The charts will be advertised to teachers in the magazine ' Home Economics '.

Paid for Publicity

Four women's magazines, ' Woman's Journal ', ' Woman's Companion ', ' Home and Country ' and the ' Townswoman ' are carrying a series of advertisements.

Paper Bags

The publicity paper bags, with which most members are familiar, are being advertised to retailers in ' The Fruit Trades' Journal and bags carrying a new design are now available.*

Point of Sale Material

Point of Sale material has been the subject of much discussion at Publicity Sub-Committee meetings and the only method of distributing point of sale material which the Association can contemplate at this stage is the chip cover which was shown in the June bulletin. Many other types of price ticket and methods of distribution were discussed but were all found to be far out of our range.

Transfers

Another aspect of publicity which the Association has investigated is advertising mushrooms on members' vans, etc. A design for a transfer, which can be applied very simply, is still in the stages of discussion but members will be notified as soon as these are available.

Leaflets

A new cookery leaflet, giving simple, basic recipes, is now ready and the ' Month by Month ' leaflets have been re-printed with a new set of recipes.

We hope to be able to give members more frequent publicity news and, in our turn, we should greatly appreciate ideas and suggestions, which will always be given consideration by your Publicity Sub-Committee.

PRESS HAND-OUTS

The regular production of hand-outs for the Press, calculated to interest Editors and thus gain important propaganda space for mushrooms, is no easy task but some of those circulated by the MGA's Public Relations Officer, Miss Valerie Baker, have achieved significant success. For instance, the specimen hand-out which follows, was reproduced in 29 newspapers and magazines, securing over 300 column inches for mushroom publicity.

The hand-out read:—

More cultivated mushrooms than ever before are now being eaten in this country, for production has trebled since the middle 1940's, and is still steadily increasing. More and more mushrooms are now seen in the shops up and down the country.

In actual consumption of mushrooms, France easily leads the way, the figures being $2\frac{1}{2}$ lb. per head. In England it is 12 oz. per head of the population and in America 10 oz., these being the figures during the last year.

It may well be that the increased tourist traffic from this country to Europe has, over the past year or two, encouraged English people in the use of mushrooms, a vegetable which, says the University of California, is without waste, since the cap and the stalk are equal in flavour.

You really needn't peel mushrooms—just wipe them with a damp cloth. If you feel you must peel them, well save the peelings and pop them into the stock pot.

Here are a few favourite recipes from some European countries:—

From Denmark

TUNFISK I CHAMPIGNONSOVS (Tunny with mushroom sauce)

1 lb. tunny fish
salt and pepper
paprika
butter
Tablespoon of white wine
¼ lb. mushrooms
1 tablespoon flour
little sour cream
2 yolks of egg

Rub the tunny fish with a mixture of salt, pepper and paprika. Fry it on both sides in plenty of butter over a slow heat until it is well done. Boil the cleaned, sliced mushrooms in ½ pint water for 5 minutes. Strain and keep warm. Make a sauce with butter, flour and water from the mushrooms. Bring to the boil and add the sour cream. Whisk the egg yolks with a little salt and the white wine and add to the sauce. Add the mushrooms and reheat the sauce.
Slice the tunny, place on a dish and pour the sauce over it.

From Spain

"LLOMILLO AMB MONGETES"
served in Catalonia

Roast Loin of Pork served exclusively with Mushrooms, previously cooked and tossed in the gravy from the roast.

From Switzerland

MUSHROOM TARTLETS

Pastry:	7 oz. flour	1 egg
	¼ lb. butter	1 tablespoon salted water
Filling:	1½ oz. butter	1 gill fresh cream
	1 lb. mushrooms	salt, pepper
	2 soupspoons finely chopped onions	Juice of one lemon
		1 soupspoon finest flour

Mix pastry ingredients, allow mixture to rest, roll it out very thin. Cut out tartlets with buttered pastry cutter and bake blind, propping up edges of pastry shells with dried peas. Wash and chop mushrooms, cook them in butter, adding the chopped onions. Dust with flour, stir, add the cream, season with salt and pepper, add lemon juice. Simmer for five minutes. Take pastry shells from oven and fill with mixture. Serve very hot.

From France

CHAMPIGNONS A LA CRÈME

1 lb. mushrooms
dessertspoon butter
salt, pepper
dessertspoon finely chopped onions (previously sweated in butter without colouring)
Cream

Cut the mushrooms into quarters or in thick slices, stew them in butter, adding the onion, and salt and pepper to taste. When nearly cooked, drain the liquor and cover the mushrooms with cream, allow to boil until sufficiently thick. The liquor may be reduced to a syrup and added to the mushrooms.

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More nourishment

If you use Racing Stable manure, or other manure in which excess straw is present, the use of Adco "M" is strongly advised. The fermentation of this type of manure takes place more rapidly and effectively when Adco "M" is added. You get a more thorough breakdown of the strawy material, which then becomes available as food for the growing spawn. So your compost provides more nourishment for the mushrooms, and you get a bigger crop.

Better spawn run

Adco "M" produces a good quality compost of even texture. It provides an ideal medium for spawn run and helps to avoid greasy conditions, lack of aeration, and over wet compost – all of which delay mycelium growth. The spawn is able to make more rapid use of the food provided. It establishes itself more quickly and this is again a great help in preventing diseases and weed fungi. The faster the spawn grows and fills the compost the less likelihood is there of disease and weed fungi becoming serious competitors. A quick spawn growth also gives a quicker ultimate production.

You can have freedom from uncertainty in the composting process – by using Adco "M". It will pay you hands down. Adco "M" is specially formulated as a result of years of experiment, for the specific purpose of making mushroom compost. It can be used for composting with straw alone, if you wish. Or it can be used to compensate for variations in the quality and texture of your manure supply. Adco "M" provides the way to better mushroom compost every time.

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From Germany

MUSHROOM SAUCE

4 oz. mushrooms
1 medium size onion
1 oz. butter
a little salt, pepper,
paprika and chopped parsley
1 tablespoon flour
1 gill water
1 gill sour cream

Wash and peel the mushrooms, but save the peel. Melt the butter in a saucepan, add the chopped onion and the mushrooms, salt, pepper and paprika and parsley. Put the lid on and simmer just a few minutes, till they are cooked. In another saucepan cook the mushroom peel with a few rinds of bacon in the water for 8-10 minutes, then strain them, add flour to your first saucepan and stir in the above stock. Cook for a few minutes till it thickens, finally add sour cream (heat it up) and serve hot.

PUBLICITY DRIVE THROUGH CHIP COVERS

Carriers for Point-of-Sale Material

Lack of suitable Point-of-Sale Material in the retailers' shops has concerned the MGA Publicity Committee for a long time, mainly on account of the high cost involved.

In announcing the completion of a contract with Reed Corrugated Cases Ltd., whereby it will be possible for MGA members to obtain supplies of chip covers at *preferential rates*—the covers measure 12 inches by $7\frac{1}{4}$ inches, and cater for the normal sized chips containing $2\frac{1}{2}$ lb. and 3 lb. of mushrooms—both the Executive and Publicity Committees urge members to support this effort to increase publicity at no extra cost.

The white cover will be printed in blue with a special design as illustrated which allows for the printing of members' and consignees' names and addresses in the same, or an additional, colour if required, **at no extra charge.**

The covers are perforated to allow retailers to fold and insert them in the back of the baskets with the Retail price marked in the mushroom in the top right hand corner.

The 4 lb. Mushroom Chip Cover Reference No. F/Q.0067/Z price to members will be **49/- per 1,000 for quantities of 10,000 and over,** which will enable free over-printing of names and addresses. For quantities below 10,000 the following prices will apply:—

7,500	**65/- per 1,000**
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*PUBLICITY PAPER BAGS

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RECIPE LEAFLETS

It has been decided that all current issues of MGA Recipe Leaflets and other publicity material should be made available to MGA members at half the cost price. Samples can be had from the MGA office, together with prices.

Rockets !

THIS ROCKET AGE

The Editor gratefully acknowledges the following:—

A rocket from the Executive Committee, for not making the *Bulletin* brighter (Sh! there's a great chance here for some interesting pictures!).

A rocket from the Publicity Committee, for not giving sufficient space to publicity news.

A rocket from Mr. Middlebrook and his Pinheads—although the Editor protests strongly about being quoted out of context. Perhaps this protest should take the form of one concentrated Baa ! (see page 263).

All of which partly explains why your Editor —Secretary is going away on holiday from 17th July to 7th August, so please keep your correspondence down to a minimum.

WESTON-SUPER-MARE CONFERENCE

Arrangements in connection with the MGA Conference at Weston-Super-Mare, which opens with a " Get Together " at The Grand Atlantic Hotel, on the evening of Monday, 10th October, are beginning to take shape.

Among those who have promised to give papers are:—Dr. von Sengbusch (Active Mycelium Method), Dr. R. L. Edwards (Ventilation), Mr. C. H. Fawcett of Burgess & Co. (Heating), Mr. Robt. Patterson, B.Sc., Belfast (" Whither Mushroom Growing "), Mr. N. R. Cooper (Problems Connected with a Small Farm), Mr. Graham Griffiths (Problems Connected with a Large Farm), Mr. E. H. Gardener, Chairman of the NFU Horticultural Committee (Policy), Mr. R. Duthy (Twenty-five years of Mushroom Growing), Mr. V. L. Barrow, B.Sc. (Composting by Analysis), Dr. Hussey, Miss Gandy and Mr. Flegg of the Glasshouse Crops Research Institute.

Dr. E. B. Lambert of America, Life Member of the MGA, will also give a paper, provided he obtains permission from the USA Department of Agriculture.

Present arrangements are that there will be lectures all day on Tuesday, with the exception of a period late in the afternoon when the mushroom competitions will be judged. Because there was some criticism of the judging last year at Folkestone, MGA Grower Members, who are not competing, will be asked to judge. Parties of three growers will judge each class.

The Reception and the Dance will now take place on Tuesday evening, and lectures will be continued until about 5 p.m. on Wednesday, 12th October.

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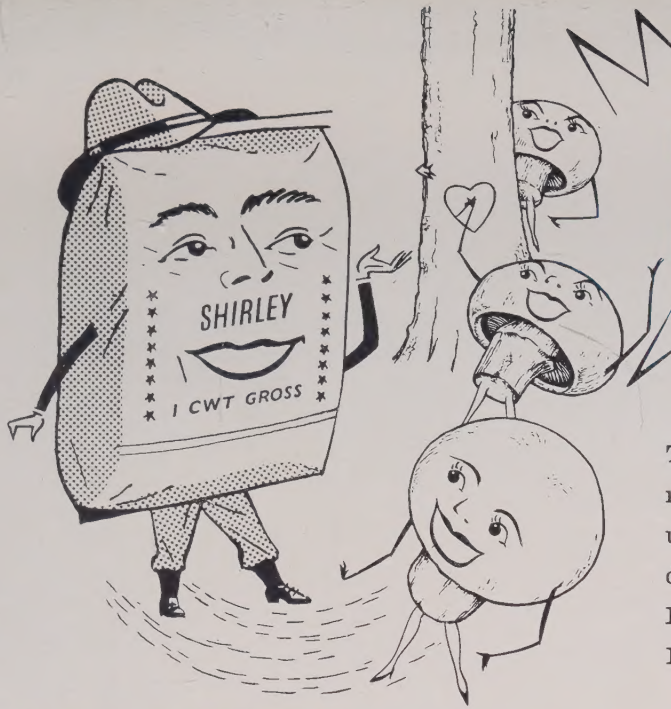

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